

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE FORM PTO-1390 (REV 11-98)		ATTORNEY'S DOCKET NUMBER P-6374.03
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/380351
INTERNATIONAL APPLICATION NO. PCT/GB98/00648	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED 04 March 1997
TITLE OF INVENTION LONGITUDINAL COLD SEPARATION DEVICE		
APPLICANT(S) FOR DO/EO/US Edwin James DuMorris EDDY, et al.		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). <input checked="" type="checkbox"/> has been transmitted by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). <input checked="" type="checkbox"/> have been transmitted by the International Bureau. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. <input type="checkbox"/> have not been made and will not be made. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). 		
Items 11. to 16. below concern document(s) or information included:		
<ol style="list-style-type: none"> <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. <input type="checkbox"/> A substitute specification. <input checked="" type="checkbox"/> A change of power of attorney and/or address letter. <input checked="" type="checkbox"/> Other items or information: A Verified Declaration Claiming Small business Concern. 		

510 Rec'd PCT/PTO 31 AUG 1999

U.S. APPLICATION NO. (if known, see 37 CFR 1.3)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER			
09/380351	PCT/GB98/00648	P-6374.03			
<p>17. <input checked="" type="checkbox"/> The following fees are submitted:</p> <p>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :</p> <p>Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$970.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$840.00</p> <p>International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$760.00</p> <p>International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$670.00</p> <p>International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$96.00</p>		CALCULATIONS PTO USE ONLY			
ENTER APPROPRIATE BASIC FEE AMOUNT =		\$ 840			
<p>Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).</p>		\$ 0			
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	25 - 20 =	5	X \$18.00	\$ 90	
Independent claims	2 - 3 =	0	X \$78.00	\$ 0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00	\$ 0	
TOTAL OF ABOVE CALCULATIONS =		\$ 930			
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).		\$ 465			
SUBTOTAL =		\$ 465			
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).		\$ 0			
TOTAL NATIONAL FEE =		\$ 465			
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property		\$ 40			
TOTAL FEES ENCLOSED =		\$ 505			
		Amount to be: refunded \$ charged \$			
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>505</u> to cover the above fees is enclosed.					
b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.					
c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>07-2400</u> . A duplicate copy of this sheet is enclosed.					
<p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p> <p><i>Thomas E. Sisson</i></p>					
<p>SEND ALL CORRESPONDENCE TO</p> <p>Thomas E. Sisson Jackson Walker L.L.P. 112 E. Pecan Street, Suite 2100 San Antonio, Texas 78205</p> <p>Phone: (210) 978-7700</p>					
<p>SIGNATURE</p> <p>Thomas E. Sisson</p> <p>NAME</p> <p>29,348</p> <p>REGISTRATION NUMBER</p>					

P-6374.03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application Of: §
Edwin James DuMorris EDDY, et al. §
§
International Application No.: PCT/GB98/00648 §
§
International Filing Date: §
§
Title: LONGITUDINAL COLD SEPARATION DEVICE §

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Commissioner of Patents
and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

This preliminary amendment is being filed upon entry into the U.S. national phase. The claims were amended under Article 19, and are being further amended herein.

Please cancel claims 1-25 and insert new claims 26-50 as follows:

26. A cold separation device for separating an elongate member along a substantially longitudinal axis thereof, said device comprising a separation unit having a cutter, support means extending upstream and downstream of said separation unit to support said elongate member, and a feeder means to feed said elongate member towards and through said separation unit, wherein said feeder means feeds said elongate member, and said support means extends in a direction substantially parallel to said substantially longitudinal axis of said elongate member.
27. A device according to claim 26, wherein said cutter comprises a saw blade.

28. A device according to claim 27, wherein said saw blade is selected from the group consisting of a reciprocating saw blade and a band saw blade.

29. A device according to claim 26, wherein the speed of said blade is adjustable.

30. A device according to claim 29, wherein said speed of said blade is adjustable between 40 and 190 metres per minute.

31. A device according to claim 26, wherein the speed of said feeder means is adjustable.

32. A device according to claim 31, wherein said speed of said feeder means is adjustable between 0 and 1 metre per minute.

33. A device according to claim 26, wherein said separation unit comprises a support means to support an underside of said elongate member.

34. A device according to claim 26, wherein said separation unit comprises means to constrain lateral movement of said elongate member passing therethrough.

35. A device according to claim 34, wherein said means to constrain lateral movement of said elongate member comprises at least one pair of horizontally spaced apart rollers, said rollers being rotatable about a substantially vertical axis.

36. A device according to claim 35, wherein each roller of a pair is mounted so that the distance therebetween may be adjusted.

37. A device according to claim 26, wherein said separation unit comprises a roller arranged to exert a downward pressure on a part of an elongate member being cut.

38. A device according to claim 26, wherein upstream of said separation unit said support means is provided with alignment means to align a substantially longitudinal axis of an elongate member with said cutter of the separation unit.

39. A device according to claim 38, wherein said alignment means comprises at least two guides each mounted so as to be movable laterally to said support means.

40. A device according to claim 26, wherein said support means comprises at least one support table located upstream of said separation unit and at least one support table located downstream of said separation unit.

41. A device according to claim 40, wherein at least one table mounted downstream of said separation unit is a receiving table and is so dimensioned as to enable said table to receive and support separated sections issuing from said separation unit.

42. A device according to claim 41, wherein said receiving table comprises at least one pair of support members, each member being mounted on said table so as to be movable horizontally and vertically so as to engage with and support a part of said separated elongate member.

43. A device according to claim 41, wherein said receiving table further comprises means for moving a section resting thereon laterally across said table.

44. A device according to claim 43, wherein said means for moving comprises at least one conveyor, each conveyor being provided with at least one upstanding member protruding above a surface of the table so as to engage with a section of said upstanding member resting on said table.

45. A device according to claim 40, wherein at least one of said tables comprises a plurality of rollers.

46. A device according to claim 45, wherein said rollers of at least one table are driven.

47. A device according to claim 40, wherein at least one table located upstream of said separation unit comprises said feeder means.

48. A process for separating elongate members using a cold separation device for separating an

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elongate member along a substantially longitudinal axis thereof, said device comprising a separation unit having a cutter, support means extending upstream and downstream of said separation unit to support said elongate member, and a feeder means to feed said elongate member towards and through said separation unit, wherein said feeder means feeds said elongate member and said support means extends in a direction substantially parallel to said substantially longitudinal axis of said elongate member, said process comprising the steps of:

placing an elongate member on said support means of said device;

aligning a substantially longitudinal axis of said elongate member with said cutter of said separation unit;

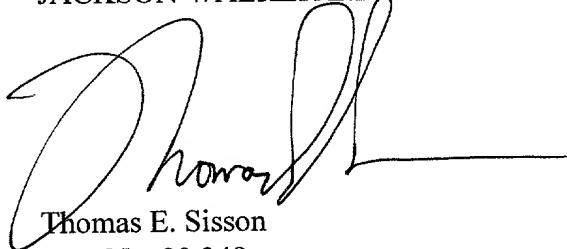
feeding said elongate member through said separation unit; and

supporting resulting separated sections.

49. A process according to claim 48, further comprising the steps of constraining lateral movement of said elongate member in said separation unit.

50. A process according to claim 48, further comprising the step of supporting said separated sections issuing from said separation unit.

Respectfully submitted,
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I

CERTIFICATE OF EXPRESS MAILING

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited on the date shown below with the United States Postal Service, as Express Mail Post Office to Addressee (37 CFR 1.10), Mailing Label No. EL423208702US, addressed to Box PCT, Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Date: August 31, 1999


Bianca Grossweiler

P-6374.03

Applicants: Edwin James DuMorris EDDY, Shay Vincent EDDY,
Delville Edwin EDDY, and Paul Anthony EDDY

For: LONGITUDINAL COLD SEPARATION DEVICE

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) and 1.27(c))-SMALL BUSINESS CONCERN

I hereby declare that I am an official of the small business concern empowered to act on behalf of the concern identified below:

EDMET INTERNATIONAL LIMITED
52-54 Oswald Road, Scunthorpe,
North Lincolnshire DN 15 7PQ
United Kingdom.

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed, to and remain with the small business concern identified above with regard to the invention LONGITUDINAL COLD SEPARATION DEVICE, by inventors Edwin James DuMorris EDDY, Shay Vincent EDDY, Delville Edwin EDDY, and Paul Anthony EDDY, described in the specification filed herewith.

If the rights held by the above identified business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

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P. 10

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

EDMET INTERNATIONAL LIMITED
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United Kingdom.

EJD Eddy
(Signature of officer)

EJD

E. J. D. EDDY
(Printed name and title of officer)

Date: 26 AUGUST 1999

DEVICE FOR COLD CUTTING ELONGATE MEMBERS ALONG A LONGITUDINAL AXIS**Field of the Invention**

This invention relates to a device for separating elongate members along a longitudinal axis, and to a method of separating elongate members along a longitudinal axis
5 using the device of the invention.

Background to the Invention

Steel sections and steel piling often require splitting along their lengths to provide a desired shape of section. For example, by splitting an "I" beam along the longitudinal centre line of the web thereof, a pair of "T" sections can be produced. Similarly,
10 by splitting a box section along the longitudinal centre line thereof, a pair "U" shaped channel members can be produced. Many other shapes can be produced by starting with differently shaped products including double rolled sections, for instance bulb flats, conventional flats, grader bars and channels can all be double rolled and then split along their lengths.

Traditionally, oxy-propane or oxy-acetylene torches have been used to split elongate steel members longitudinally. When splitting a member using such torches it is common practice when commencing splitting to cut the member at spaced apart intervals in order to avoid the halves of the member bowing outwards or inwards. This practice is known as stitching. As a secondary operation, the stitches (which are short in comparison with the cuts) are removed, again using and oxy-propane or oxy-acetylene torch. Using these torches poses a number of problems. First, the separating process is slow and requires a significant amount of labour. Secondly, the operation is dangerous. Occasionally, the stitches holding the member together are too weak to withstand the internal stresses in the member created during its manufacture. If this is so, the member may break the stitches and spring outward or inward without warning. Such an event could result in injury or loss of life. Thirdly, heat generated during separation accentuates any inherent tendency in the member to bend during separation. Fourthly, the finish on the separated edges is of a low standard and often requires milling to establish an edge that can be welded to.

In order to overcome the problem of speed of operation, and quality of finish plasma guns have been introduced. However, these still often use the "stitching" tech-

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nique. Additionally, plasma guns operate at higher temperatures than do flame cutters, i.e. oxy-propane or oxy-acetylene torches. Whilst less dross and slag is produced during separation with plasma cutting compared to flame cutting, the resulting edges must nevertheless be dressed. The heat generated during flame and plasma cutting also causes metallurgical changes to the steel in the region of the cut. In plasma cutting the region can extend 5mm to 15mm to either side of the cut along the full length thereof, whereas in flame cutting the metallurgical changes extend further but are less marked. As the steel cools, or when it is straightened cracking can occur. These metallurgical changes are unacceptable, and because of this, the industry will not permit the splitting of members having a web thickness of 20mm or greater using plasma guns or flame cutting.

In terms of rolling steel, it can be advantageous to double roll sections, i.e. two angles are rolled as a channel. This is because the throughput of the mill is increased, and therefore its costs of production are decreased. It is known to split double rolled sections in half by snapping the section in two along a line of weakness. For example, angles may be formed by splitting a channel along a longitudinal line of weakness. The problem with sections produced by double rolling and splitting them in the manner described is that the finish is extremely poor.

In US 5033610 a support station is described, the station being used to support workpieces shaped as U-, I-, L-, T- or circular profiles, whilst they are cut using a flame cutter. The workpieces are cut to length, rather than longitudinally.

In US 4693761 a device and process for cutting or welding profiles using a robot having a cutting torch attached thereto is described. The device and process are used for cutting profiles to length, rather than for cutting them longitudinally.

25 **Summary of the Invention**

According to the invention, there is provided a cold separation device for separating an elongate member along its length, the device comprising a separation unit comprising a cutter, support means to support the elongate member upstream and downstream of the separation unit, and a feeder means to feed the said member towards and through the separation unit.

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The cutter may comprise a saw blade, the said blade being a reciprocating blade, or a band saw blade. Alternatively, the cutter could comprise a water jet. The speed of the blade and/or the feeder means may be adjustable. Advantageously, the speed of the band saw blade is adjustable between 40 and 190 metres per minute. The speed of the feeder means is suitably adjustable between 0 and 1 metre per minute.

The separation unit may comprise a support means to support the underside of an elongate member.

Preferably, the separation unit comprises means to constrain lateral movement of an elongate member passing therethrough. The said means to constrain lateral movement of an elongate member may comprise at least one pair of horizontally spaced apart guide members, said guide members suitably being rollers rotatable about a substantially vertical axis. Each guide member of a pair may be mounted so that the distance therebetween is variable. Advantageously, the roller carriers are each mounted on a threaded spindle. Preferably, the or each roller is mounted on a roller carrier, and a pair of roller carriers is provided, the roller carriers being movable towards and away from each other. The roller carriers may be mounted on the same threaded spindle, the threads thereof winding in opposite directions towards or away from the centre of the spindle.

The separation unit suitably comprises a roller arranged to exert a downward pressure on a part of an elongate member being cut.

Preferably, upstream of the separation unit the support means is provided with alignment means to align a substantially longitudinal axis of the elongate member with the blade of the separation unit. The said alignment means may comprise at least two guides each mounted so as to be movable laterally to the support means. Each guide may be mounted on a threaded spindle to provide for the said lateral movement. Each guide may comprise at least one wheel.

The said support means may comprise at least one support table located upstream of the separation unit and at least one support table located downstream of the separation unit. Preferably, at least one table mounted down stream of the separation unit is a receiving table and is so dimensioned as to enable it to receive and support separated sections issuing from the separation unit. The said receiving table may com-

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prise at least one pair of support members, each member being mounted on the table so as to be movable horizontally and vertically so as to engage with and support a section of a separated elongate member. Each support member suitably comprises a roller. Advantageously, the receiving table further comprises means to move a section 5 of a separated elongate member resting thereon laterally across the table. The said means may comprise at least one conveyor, the or each conveyor being provided with at least one upstanding chock protruding above the surface of the table so as to engage with a section resting on the table. At least one of the tables may comprise a plurality 10 of rollers. The rollers of at least one table are driven. Preferably, at least one table located upstream of the separation unit comprises the said feeder means.

Another aspect of the invention provides a process for separating elongate members using a longitudinal cold separation device according to the invention comprising the steps of:

- a. placing an elongate member on the support means of the device;
- 15 b. aligning a longitudinal axis of the elongate member with the blade of the separation unit;
- c. feeding the elongate member through the separation unit; and
- d. supporting the resulting separated sections.

The process may further comprise the step of constraining lateral movement of 20 the elongate member in the separation unit.

The process may further comprise the step of supporting the separated sections issuing from the separation unit.

The process may further comprise the step of moving the separated sections across the receiving table of the invention.

25 The process may be characterised by controlling the speed of the blade and/or the feeder means.

The device of the invention can be operated substantially manually. However, the adjustment of the alignment means, the support means, the pressure roller and the lateral constraining means of the separation unit, and the support members of the receiving table may all be adjusted using suitable actuators, for example linear motors, 30

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hydraulic rams or motors, or electric motors. Each of these actuators may be controlled remotely from a work-station.

The device and process of the invention are particularly advantageous because the finish of the edge cut by the device of the invention is far superior to the finish of the cut edge produced by known hot separation techniques. The finish provided by the device according to the invention permits welding thereto with no further finishing process, whereas to achieve an equally good finish on a member cut using known techniques a further process, for example milling of the cut edge, would be required. In addition to its use for separating, in appropriate circumstances the device and process can be used instead of milling to provide a finished edge on an elongate product. The process of the invention does not induce the metallurgical changes induced by plasma cutting, and therefore the separation process of the invention can be used for webs of all thickness including webs having a thickness of 20mm or greater. The absence of heat in the process means that the resulting separated pieces are not bent to the same degree as those resulting from a hot separation process. This is significant because there is a high labour cost involved with straightening out bent sections. The device also permits double rolled sections to be split. It is particularly desirable for rolling mills to be able to double roll sections, since this reduces costs. Lastly, the device and process of the invention are much safer to use than known separation methods. This is because a continuous cut is made along the length of the member to be separated, rather than using the stitching technique, and furthermore, there is no requirement for the operator to be close to the member being separated.

Brief Description of the Drawings

In the drawings which illustrate an exemplary embodiment of a longitudinal cold separation device according the invention:

Figure 1 is a plan view of a longitudinal cold separation unit according to the invention;

Figure 2 is schematic representation of a part of the device shown in Figure 1 carrying an I-beam;

Figure 3 is plan view of a part of the device shown in Figure 1 having an I-beam mounted thereon;

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Figure 4 is an end view of the support members of the receiving table supporting the separated sections of an I-beam mounted thereon;

Figure 5 partial cross-section of a part of the separation means of the device;

Figure 6 is a plan view of the part illustrated in Figure 5; and

5 Figure 7 is an end view of the part illustrated in Figures 5 and 6.

Detailed Description of the Preferred Embodiments

Figure 1 illustrates a longitudinal cold separation device comprising support means in the form of a table 1, the table comprising a plurality of horizontal rollers 2, a pusher arm 4 which is driven by an electric motor, and a rack 3. The electric motor 10 drives a pinion which engages with the rack 3 to move the pusher arm 4 back and forth along the table. The electric motor suitably drives pinion through a gear box. The electric motor, gearbox, pinion and rack 3 are not shown in detail, since these features are well known to those skilled in the art and are commonly available. The table 1 is provided with a plurality of alignment wheels 5. The alignment wheels 5 are mounted 15 on a threaded spindle 6 so that when the handle 7 of a spindle 6 is turned, the alignment wheel 5 mounted thereon moves across the table.

The alignment wheels are also shown in Figure 2. It can be seen that scales 8 are provided for each alignment wheel so that an elongate member such as the I-beam 9 can be cut lengthways along a desired axis. Usually, the elongate member is positioned so that the centre line thereof is aligned with the blade of the cold separation 20 means 12.

Referring again to Figure 1, it can be seen that the support means further comprises a second table 16 and a cold separation unit 10 located between the tables 1, 16. The second table 16 comprises a plurality of driven rollers 17. Rollers 17 may be 25 driven by any suitable means, such as an electric or hydraulic motor. The cold separation unit comprises a plurality of vertically mounted rollers 11. The rollers 11 are mounted on a frame 13 which is in turn slidably mounted on the frame 15 of the cold separation unit 10. A threaded spindle 14 provides for movement of the rollers 11 towards and away from the cold separation means 12.

30 Downstream of the second table 16 the support means comprises a third table 18 comprising a frame 23 having a plurality of rollers 19 mounted therein. It can be

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seen that pairs of rollers 19 are employed to extend across the width of the table 23, and that the rollers 19 of a pair are off-set and over lap. A pair of rollers is used instead of a single roller because when the elongate member reaches the third support member it is at least partially separated into two sections. The table 23 is also provided with a plurality of support members 22 which are movable in both the horizontal and vertical directions. Additionally, the table 23 is provided with means to move separated elongate members from one side of the table to another. The said means comprises three spaced apart conveyors 21. The conveyors can be driven independently, and each comprises a chain extending around rollers. Each chain is provided with at least one upstanding chock which extends above the upper surface of the table 23. The manner in which the conveyors 21 and the support members 22 function is described in greater detail with reference to Figure 4.

The cold separation means is shown in detail in Figures 5 to 7. The cold separation unit 10 comprises a band saw having a saw blade 26 which passes through a slot 32 in a support block 27 moving in the direction indicated by arrow Y. The support block 27 carries three pairs of support rollers 28, each roller being mounted on a shaft 31. The position of the support block 27 is movable vertically in the direction indicated by arrow X with respect to the frame 15 of the cold separation unit 10. This is so that the support rollers 28 can be raised or lowered into a position where they just touch, and thereby support, the part of the elongate member to be separated. In Figures 5 to 7, the support rollers 28 are supporting the web of an I-beam 9 travelling into the cold separation unit in the direction Z. The support block 27 can be raised or lowered by any suitable means, for example a hydraulic ram or a linear motor. Mounted above the support block 27 is a pressure roller 30 which is mounted on a carriage 29 by means of a shaft 33. The carriage 29 may be raised or lowered according to the dimensions of the elongate member to be separated, in order that the pressure roller 30 may rest on and exert a downward pressure on a part of the said elongate member. In order to provide for the collection of swarf during the separation process, the engaging surface may be roughened.

In Figure 6, the pressure roller 30 is set back from the support block 27.

The process of longitudinal cold separation according to the invention will now be described with reference to Figures 1 to 7. The product to be separated, for example an I-beam 9 is lifted on to the first table 1 by means of a crane. The outside width of the beam is measured, and the handles 7 are turned so that the alignment wheels 5 bring the beam into a position where the desired line of separation is aligned with the saw blade 26 of the cold separation means 12. In most cases the desired line of separation will be the longitudinal centre line of the product to be separated, though offset cutting and edging can be carried out using the device and process of the invention.

The drive means driving the pusher arm 4 is activated and the beam 9 is pushed slowly in the direction indicated by arrow Z towards the cold separation unit 10.

The height of the support block 27, and hence the support rollers 28 is then adjusted so that the underside of the web of the I-beam 9 will rest on the said rollers. Initially, the pressure roller 30 is lifted clear of the I-beam 9.

When the I-beam 9 and the support block 27 are in the correct positions, the band saw is switched on. As saw blade 26 engages with the I-beam 9 cutting begins. The pusher arm continues to push the I-beam 9 past the saw blade 26. When the leading edge of the I-beam 9 has passed over the support block 27, fine adjustment of the height of the support block 27 may be made, and the pressure roller 30 may be brought down into engagement with the upper surface of the web of the I-beam 9, so that the position shown in Figure 5 is reached.

The blade speed of the band saw is advantageously in the range 40 to 190 metres per minute. The pusher arm is advantageously driven at a speed in the range 0 to 1 metre per minute. These speeds are dependent upon the thickness and hardness of the product to be cut. Advantageously, the drive means driving the pusher arm can vary the speed infinitely in the desired range.

The downward pressure exerted on the web of the I-beam 9 by the pressure roller 30 attenuates vibration which reduces the possibility of saw blade failure and decreases noise levels.

As the I-beam 9 continues to be pushed in the direction Z, the underside thereof meets the second support means 16, the driven rollers 17 thereof pulling the I-beam 9 in the direction Z.

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As the separation process continues, the separated end of the I-beam 9 reaches the third support means 18. The resulting left hand T-section 9a being supported on rollers 20, and the resulting right hand T-section 9b being supported by the rollers 19. As can be seen from Figure 3, the T-sections produced by the cold separation process 5 tend to be curved. This is due to the inherent stresses in the I-beam 9 caused by the rolling process. There is a tendency for the T-sections 9a and 9b to fall inwards. If the T-sections were to fall inwards, the saw blade may be damaged. In order to support the said T-sections, support members 22 (best shown in Figure 4) are provided. As the leading edge of the T-sections moves past the first pair of support members 22 they are 10 adjusted horizontally and vertically so that a roller 25 supports the under side of the web of each T-section 9a, 9b so that the flange of each section is substantially vertical. As the I-beam 9 is advanced further in the direction Z, so it becomes necessary to support the resulting T-sections 9a, 9b at more locations. Further pairs of support members 22 are therefore provided, each being adjustable horizontally and vertically so that 15 the roller 25 thereof may engage with the web of one of the T-sections 9a, 9b.

When the I-beam 9 is fully separated, the rollers 17 of the second table 16 continue to be driven, thereby driving the T-sections 9a and 9b almost fully on to the third support means 18.

The T-section 9a can be removed from the receiving table 18 using a forklift 20 truck for example. Before the T-sections are removed, the support members 22 are retracted. It may be desirable to be able to move the T-sections from one location on the table 18 to another. For example, where access to the table 18 is only available from one side, and a forklift truck is being used to remove the T-sections from the table, then it is necessary to move the T-section 9b across the table. This is done by the 25 conveyors 21. As the conveyors 21 are driven, upstanding chocks come into engagement with the T-section 9b and push it from one side of the table 18 to the other, from where it can be lifted off.

Whilst the description refers to an I-beam, the device may be used to separate products having any profile, for example, box section, channel section, tubular section, 30 piling, or flats, and double rolled sections. Where the products are suitably shaped to permit stacking thereof, for example double rolled section, flats, universal flats, a num-

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ber of the products may be stacked one on top of the other to increase the through put of the machine.

AMENDED CLAIMS

[received by the International Bureau on 4 August 1998 (04.08.98);
original claim 1 amended ;
remaining claims unchanged (1 page)]

1. A cold separation device for separating an elongate member along a substantially longitudinal axis thereof, the device comprising a separation unit having a cutter, support means extending upstream and downstream of the separation unit to support the said elongate member, and a feeder means to feed the said elongate member towards and through the separation unit, wherein the feeder means feeds the said elongate member, and the support means extend in, a direction substantially parallel to the said substantially longitudinal axis of the elongate member.
2. A device according to Claim 1, wherein the cutter comprises saw blade, the
10 said blade being a reciprocating blade or a band saw blade.
3. A device according to Claim 1 or 2, wherein the speed of the blade and/or the feeder means is adjustable.
4. A device according to Claim 3, wherein the speed of the blade is adjustable between 40 and 190 metres per minute.
- 15 5. A device according to Claim 3 or 4, wherein the speed of the feeder means is adjustable between 0 and 1 metre per minute.
6. A device according to any preceding claim, wherein the separation unit comprises a support means to support the underside of the elongate member.
7. A device according to Claim 6, wherein the separation unit comprises means
20 to constrain lateral movement of the elongate member passing therethrough.
8. A device according to Claim 7, wherein the said means to constrain lateral movement of the elongate member comprises at least one pair of horizontally spaced apart rollers, said rollers being rotatable about a substantially vertical axis.
9. A device according to Claim 8, wherein each roller of a pair is mounted so
25 that the distance therebetween is variable.
10. A device according to any preceding claim, wherein the separation unit comprises a roller arranged to exert a downward pressure on a part of an elongate member being cut.
11. A device according to any preceding claim, wherein upstream of the separation unit the support means is provided with alignment means to align a sub-
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stantially longitudinal axis of an elongate member with the cutter of the separation unit.

12. A device according to Claim 11, wherein the said alignment means comprises at least two guides each mounted so as to be movable laterally to the support means.

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13. A device according to any preceding claim, wherein the said support means comprises at least one support table located upstream of the separation unit and at least one table located downstream of the separation unit.

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14. A device according to Claim 13, wherein at least one table mounted downstream of the separation unit is a receiving table and is so dimensioned as to enable it to receive and support separated sections issuing from the separation unit.

15

15. A device according to Claim 14, wherein the said receiving table comprises at least one pair of support members, each member being mounted on the table so as to be movable horizontally and vertically so as to engage with and support a part of a separated elongate member

16. A device according to Claim 14 or 15, wherein the receiving table further comprises means to move a section resting thereon laterally across the table.

20

17. A device according to Claim 14 or 15, wherein the said means comprise at least one conveyor, the or each conveyor being provided with at least one upstanding chock protruding above the surface of the table so as to engage with a section resting on the table.

25

18. A device according to any of Claims 13 to 17, wherein at least one of the tables comprises a plurality of rollers.

19. A device according to Claim 18, wherein the rollers of at least one table are driven.

20. A device according to any of Claims 13 to 19, wherein at least one table located upstream of the separation unit comprises the said feeder means.

30

21. A process for separating elongate members using a longitudinal cold separation device according to any of Claims 1 to 20 comprising the steps of:

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- e. placing an elongate member on the support means of the device;
- f. aligning a substantially longitudinal axis of the elongate member with the cutter of the separation unit;
- g. feeding the elongate member through the separation unit; and
- h. supporting the resulting separated sections.

5 22. A process according to Claim 21, further comprising the step of constraining lateral movement of the elongate member in the separation unit.

23. A process according to Claim 21 or 22, further comprising the step of supporting the separated sections issuing from the separation unit.

10 24. A process according to any of Claims 21 to 23, characterised by controlling the speed of the blade and/or the feeder means.

25. A longitudinal cold separation unit substantially as shown in, or as described with reference to, the drawings.

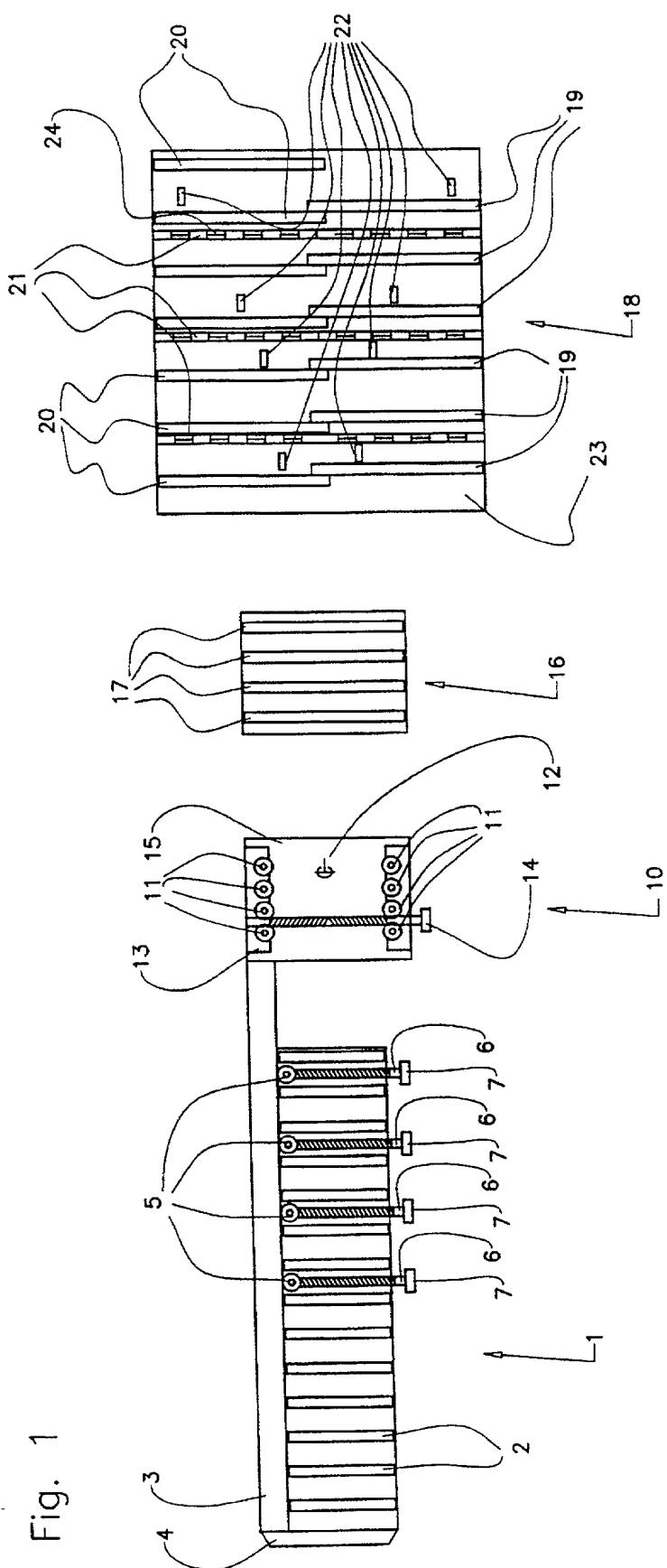


Fig. 1

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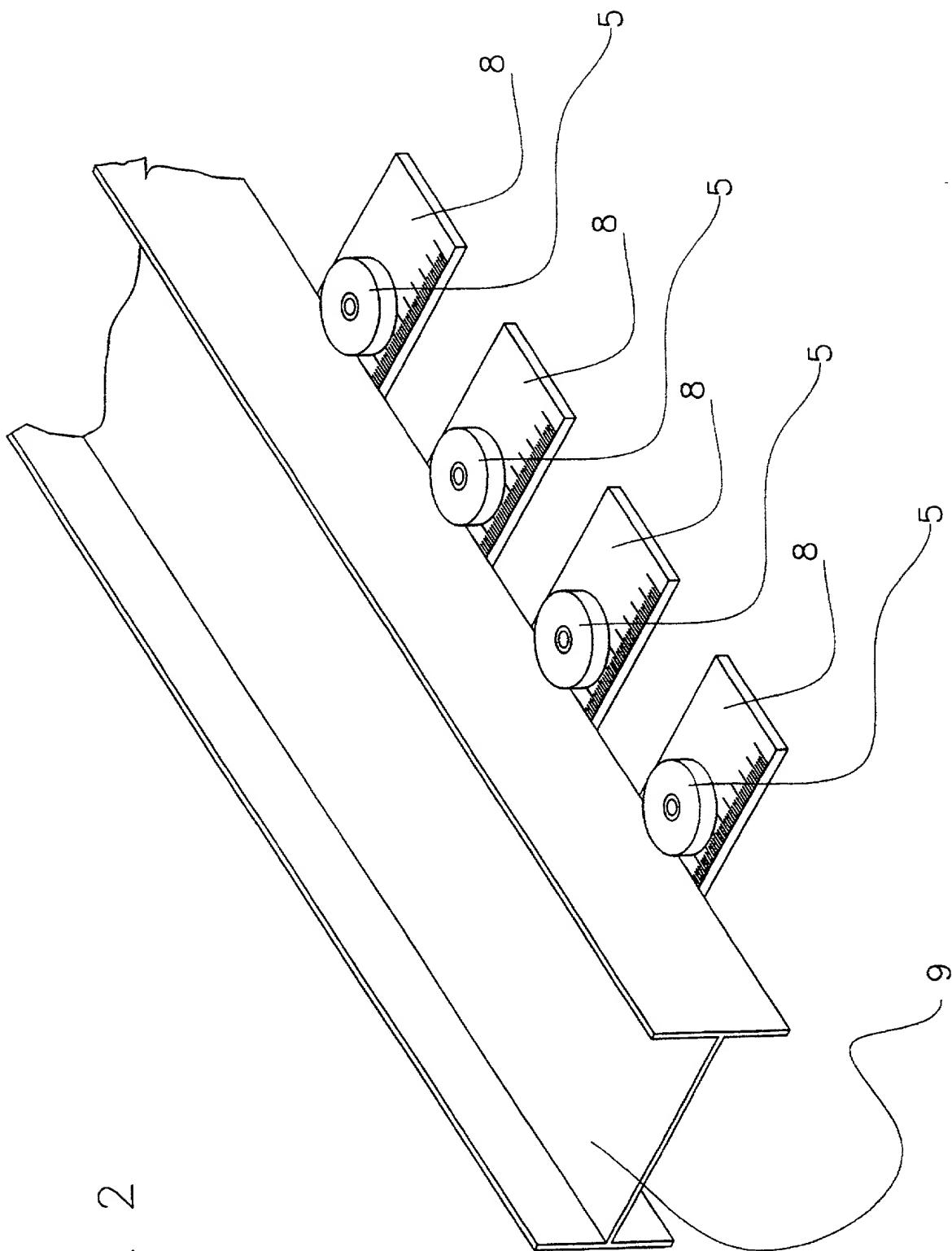
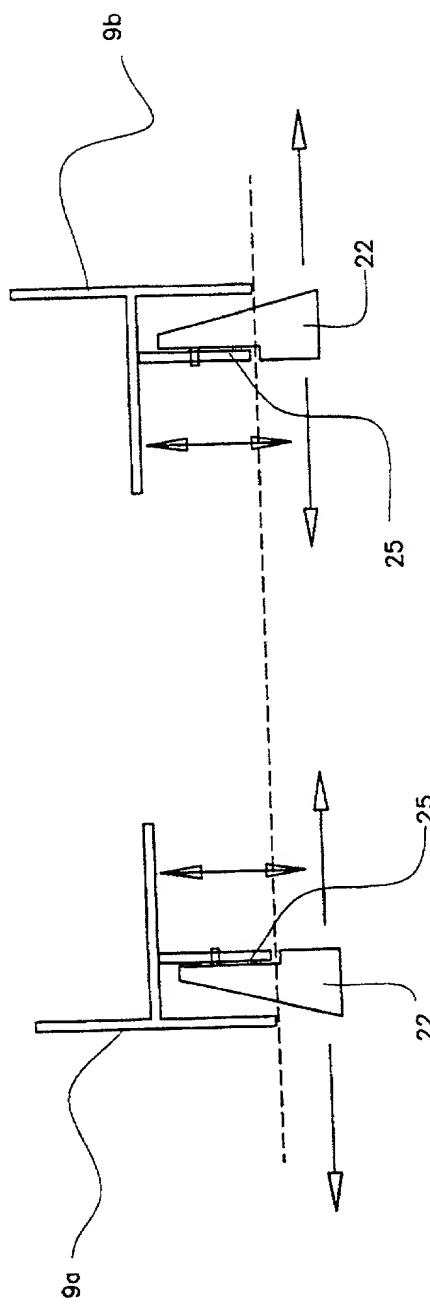
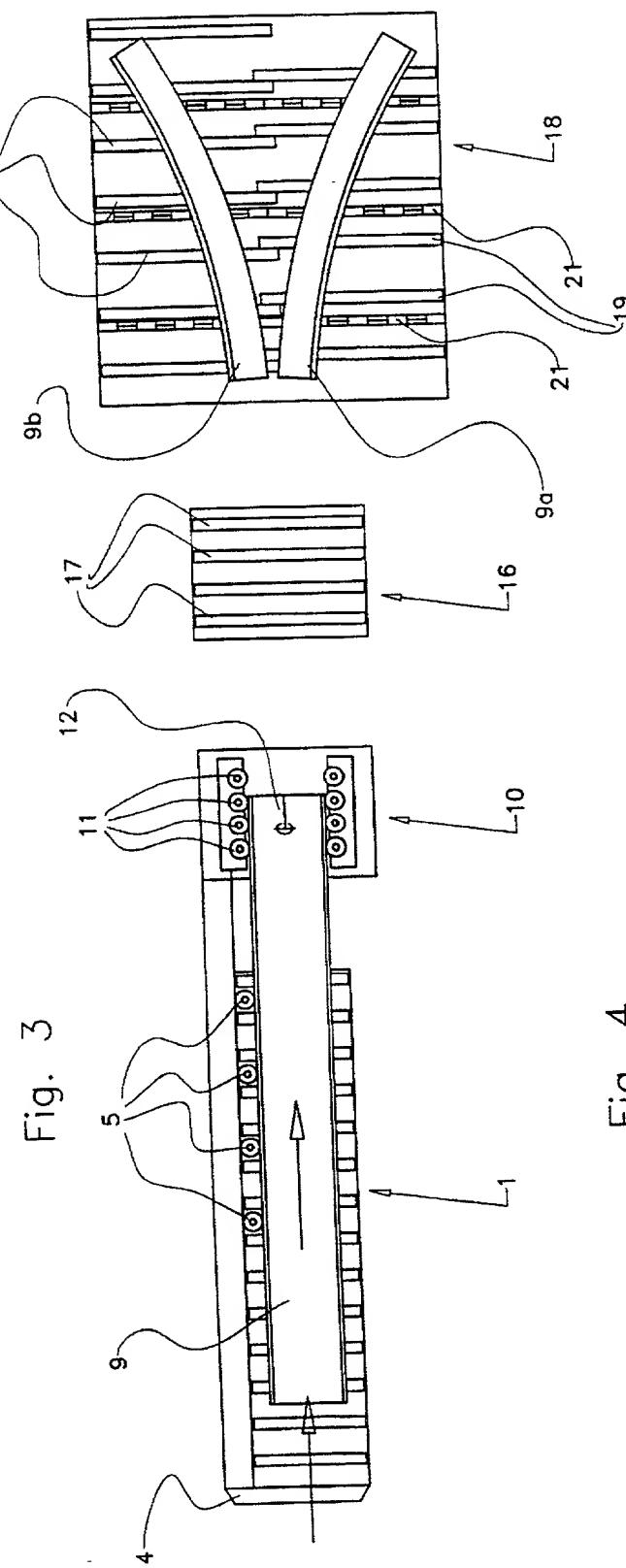


Fig. 2

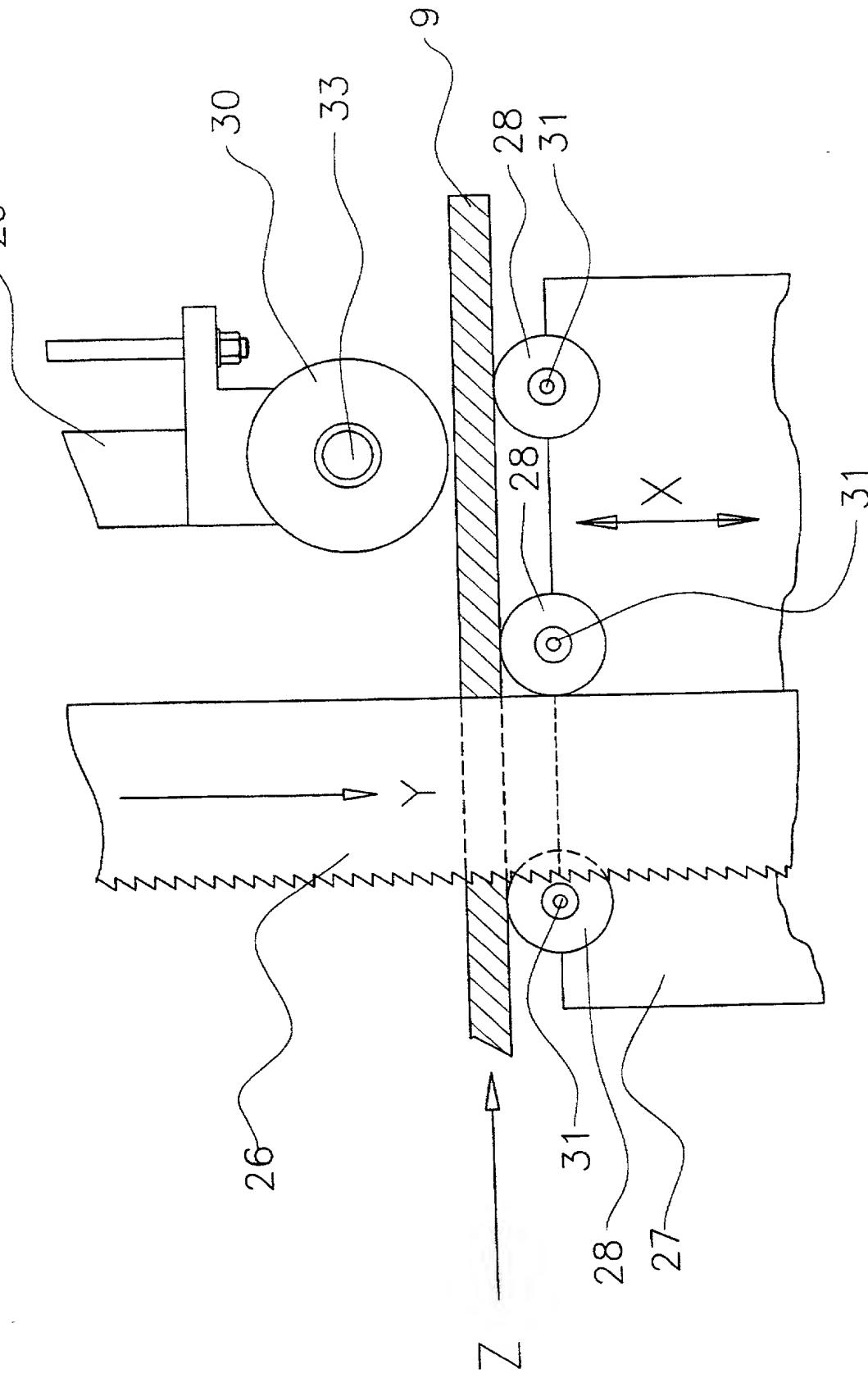


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Fig. 5



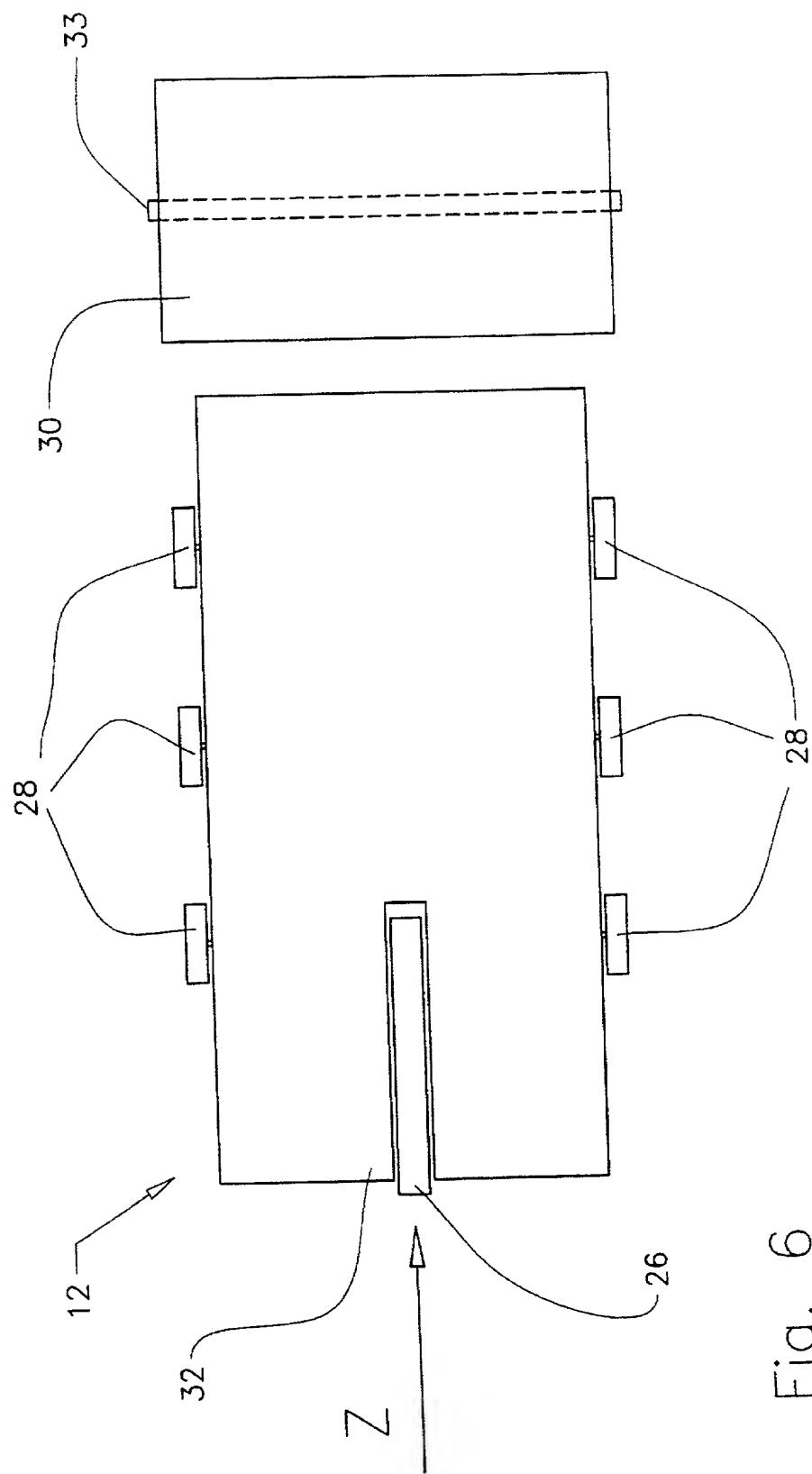


Fig. 6

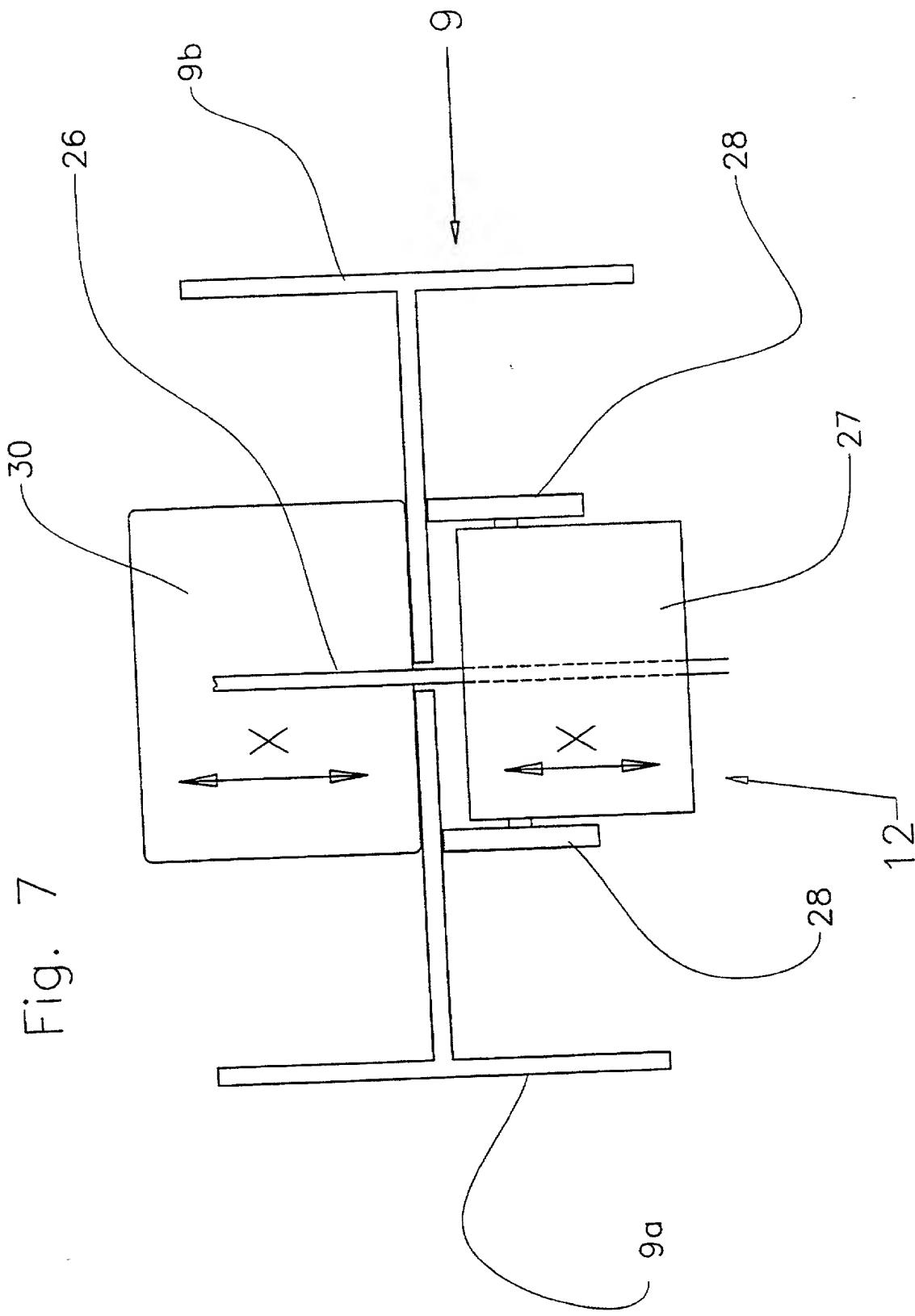


Fig. 7

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COMBINED DECLARATION AND POWER OF ATTORNEY

As a below-named inventor, I hereby declare that:

This is an original patent application.

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled LONGITUDINAL COLD SEPARATION DEVICE, the specification of which is attached hereto.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge my duty to disclose information which is material to the examination and patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed. Priority is claimed for such application which has been filed as follows:

United Kingdom, GB9704414.3, March 4, 1997;
International, PCT/GB98/00648

POWER OF ATTORNEY

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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